IN THE UNITED STATES PATENT & TRADEMARK OFFICE

In re Patent Application of)
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CHEN et al.)
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Serial No. 09/822,831)
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Filed: April 2, 2001)
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Confirmation No.: 8466

Group Art Unit: 1746

Examiner: J. Crepeau

Title: **CONDUCTING POLYMER-CARBON NANOTUBE COMPOSITE MATERIALS AND THEIR USERS**

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December 10, 2003

REQUEST FOR RECONSIDERATION

Box AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In reply to the Office Action mailed August 8, 2003, please reconsider the patentability of the pending claims based on the following arguments.

Claims 1-16 remain withdrawn from consideration as being drawn to a non-elected invention. Claims 17-24 and 26 have been rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent 6,205,016 to Niu. Applicants traverse the rejection because Niu fails to teach or suggest all the features recited in the rejected claims. For example, Niu fails to teach or suggest an electronically conducting polymer/carbon nanotube composite produced by preparing a dispersion of carbon nanotubes in a solution of one or more polymerisable monomers which upon polymerisation form an electronically conducting polymer; and polymerising the monomer solution to form a unitary polymer mass containing said nanotubes dispersed therein," as recited in independent claim 17. Similarly, Niu fails to teach or suggest an electrical energy storage device, comprising: a first electrode consisting of a first composite of carbon nanotubes and a first electronically conducting polymer and a first conducting member in contact with the first composite; a second electrode; and an electrolyte comprising mobile cations and anions, the electrolyte separating the first and

second electrodes and being in contact with the first composite, wherein the first composite consists of a unitary polymer mass containing carbon nanotubes dispersed therein and is formed by preparing a dispersion of carbon nanotubes in a solution of one or more polymerisable monomers which upon polymerisation form an electronically conducting polymer and polymerising the monomer solution to form the unitary polymer mass, as recited in independent claim 18 and its dependent claims 19-24. Further, Niu fails to teach or suggest an electrical energy storage device comprising: a first electrode comprising a first composite of carbon nanotubes and a first electronically conducting polymer, and a first conducting member in contact with the first composite; a second electrode comprising a second composite of carbon nanotubes and a second electronically conducting polymer, and a second conducting member in contact with the second composite; and an electrolyte comprising mobile cations and anions, the electrolyte separating the first and second electrodes and being in contact with the first composite, wherein each of the first and second composite consists of a unitary polymer mass containing carbon nanotubes dispersed therein and is formed by preparing a dispersion of carbon nanotubes in a solution of one or more polymerisable monomers which upon polymerisation form an electronically conducting polymer; and polymerising the monomer solution to form a unitary polymer mass," as recited in independent claim 26.

The Office Action stated that the claimed solution polymerization process results is anticipated by the structure possessed by the product of the Niu process or that the process of Niu appears to be capable of producing a product having the claimed structure; however, these characterizations are incorrect. In response to the Office's invitation, Applicants have replicated the process of Niu in the laboratory and performed comparative experiments to compare between the method of the invention and that of Niu to highlight the differences between the product produced by the claimed method and the product produced by the method of Niu. As a result, Applicants submit the attached photographs (see attached Appendix) indicating the structural differences resulting from the two significantly different methods.

Applicants note that Niu (see, Col. 9, lines 27 to 37) sets out a process of separately suspending the nanotubes and the conducting polymer in water, mixing the suspensions, and then sonicating, filtering and washing. Detailed experimental conditions are not provided by Niu; therefore, the Applicants used the following protocol for the method of Niu. First, the nanotubes and conductive polymer were separately suspended in water. This involved

suspending multiwalled nanotubes in water via acid treatment with a 70/30 mixture of nitric and sulphuric acids, followed by washing with water. This is a proven process which is well documented in the literature and which was found to be the most effective of those tried when developing the devices of the present application. This helps to ensure a fair comparison between the methods. The suspension step also involved purchasing an aqueous suspension of doped polypyrrole (5 wt%) from Sigma Aldrich as a standard product. Polypyrrole is one of the few polymers able to withstand the demanding conditions of Niu's method. Most conducting polymers in their polymerised form tend to be insoluble and difficult to disperse in water. Many conducting polymers react unfavourably with water.

Following the suspension step, the two suspendsions were mixed in a 1:1 ratio. Subsequently, sonicating was performed for 30 minutes, which allowed sufficient time for effective mixing and interaction between the nanotubes and polypyrrole. Following soncating, filtering of the resulting suspension was performed using a BDH sintered glass Buchner filter funnel. Subsequently, the sample was washed with water.

An image of the product produced by Applicant's replication of the Niu method is attached together with an image of the product produced by the method of the present application (see Appendix). The images of the resulting products are at the same magnification. As should be readily discernible, the products are very different in nature.

Discrete nanotubes coated in conducting polymer can be seen in the product produced by the method of the present invention. By contrast, the product of Niu's method does not contain visible coated nanotubes.

It was not possible to test the capacitance of films of Niu's product because the product was too brittle. However, the Applicants' tests on similar films in the past have shown capacitance to be similar to that of the pure conducting polymer, and much lower than that of the composites of the present invention. The brittleness of Niu's product would indicate that it would be unsuitable for use in electrical energy storage devices such as those claimed in claims 18-24 and 26. Therefore, this would a further distinction between that of the claimed invention and Niu.

In view of the differences between the products of Niu and of the present invention, the claims are novel over Niu. Accordingly, it is submitted that the claims are allowable over Niu and that the application is in condition for allowance. Should further issues require resolution prior to allowance, the Examiner is requested to contact the undersigned.

If there are any fees due in connection with the filing of this paper that are not otherwise accounted for, please charge our Deposit Account No. 03-3975 and refer to Order No. 011765/0280083.

Respectfully submitted

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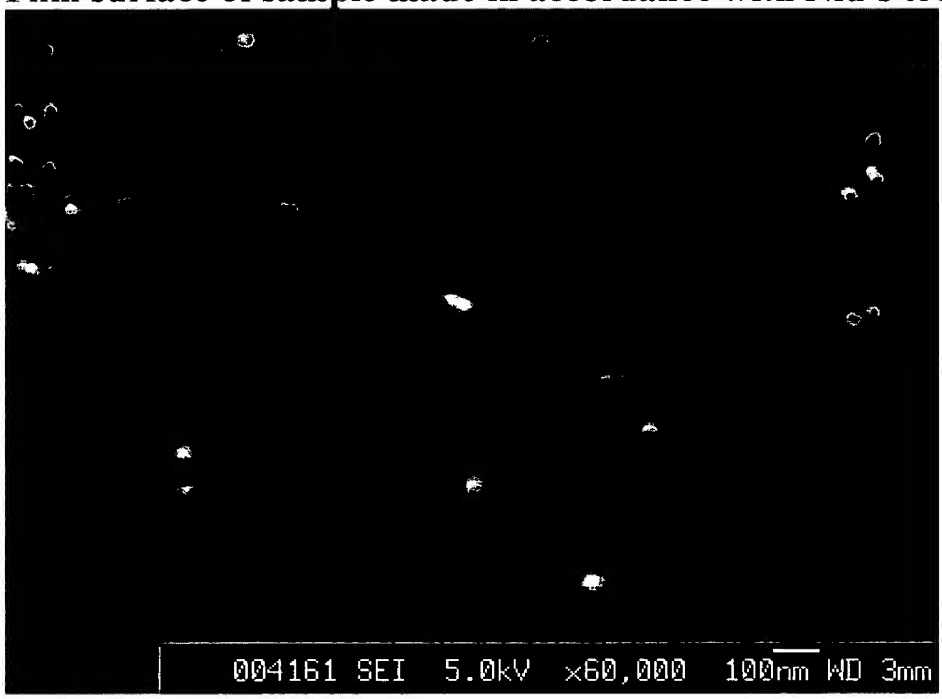
APPENDIX

Film surface of sample made in accordance with Niu's technique



Film surface of sample made using our technique